

CASE STUDY

Radioactive capsule goes missing in Australian outback

THE CHALLENGE

A tiny 8mm by 6mm radioactive capsule went missing in January 2023, somewhere along a 1400 kilometre journey from Rio Tinto's Gudai-Darri iron ore mine to its final destination in Perth, Western Australia.

The capsule contained a 20 GBq Caesium-137 (Cs-137) radioactive source. As the source was emitting high levels of radiation, enough to have significant impacts with prolonged exposure, it was imperative to find the source in a timely manner.

Its disappearance was not discovered until 25 January when the equipment was unpacked in Perth. On 27 January, Western Australia (WA) authorities notified the public that the capsule could be anywhere along the 1400-kilometre route. The WA authorities subsequently requested assistance in the source search from federal government agencies and authorities.

MULTI-AGENCY RESPONSE

ANSTO, the Australian Defence Force and the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA), all responded.

As part of ANSTO's response, our Detection and Imaging team quickly modified the CORIS360® technology to perform as a vehicle deployed detection system for the source search mission. Pre-deployment drive-by test runs of the detection equipment were undertaken using an equivalent Cs-137 radioactive source at ANSTO's facility in Sydney. This provided confidence that the modified CORIS360® could detect the missing capsule over a range of speed, distance and terrain conditions.

By Wednesday 1 February, several teams were conducting searches, including three ANSTO teams: two based in Perth and one, known as team "Bravo", in the town of Newman.



Figure 1. The radioactive capsule was lost somewhere along a 1400 km stretch of highway in Western Australia.



Figure 2. CORIS360® mounted inside the lead vehicle in the "Bravo" convoy.

DETECTING AT 70 KM/H

CORIS360® was mounted inside the lead vehicle in the "Bravo" convoy. Travelling south of Newman at 70 km/h, the CORIS360® system detected a spike in 662 keV gamma ray emissions.

An exclusion zone was quickly established. CORIS360® was then redeployed outside the vehicle where the radioactive capsule was precisely identified in a location two meters off the Great Northern Highway.

Using specialised equipment, authorities entered the exclusion zone, and safely retrieved the capsule. The capsule was then transported under escort to Perth and safely stored at an undisclosed location.

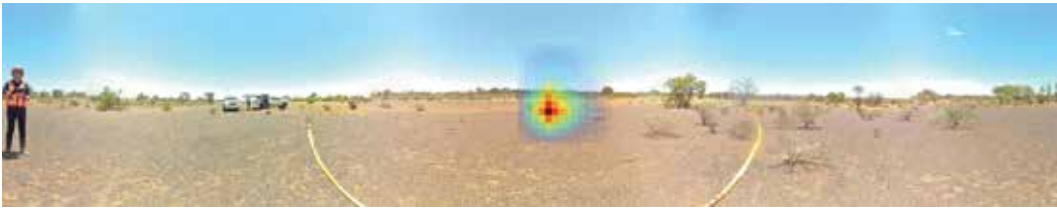


Figure 3. CORIS360® identified the exact location of the missing Cs-137 source in the Australian outback.



Figure 4. CORIS360® was deployed in the area where the capsule was detected. The temperature in the desert exceeded 40°C.



Figure 5. The missing radioactive capsule was located two metres off the Great Northern Highway.



Figure 6. The successful search team "Bravo": Dr Lachlan Chartier, Senior Physicist (back left) and Prashant Maharaji, Radiological Emergency Manager (back right), from ANSTO and Jason Paull (front left) and Dom Reay (front right) from the WA Department of Fire and Emergency Services.

CORIS360® Benefits

- 360° × 90° gamma ray imaging allows for a wide area assessment and accurate characterisation of complex radiological environments.
- Remotely detect, identify, and localise gamma emitting radiation across a wide energy range (40 keV to >3 MeV) and dose rate environments (0.5 µSv/h (0.05 mrem/h) – 40 mSv/h (4 rem/h)).
- Identify and localise multiple sources of radiation from a single acquisition.
- Enhanced characterisation of complex radioactive environments enables better planning and decision making, saving both time and money.
- Ease of setup and remote operation helps keep worker radiation exposure as low as possible.
- Easy to use interface with optical overlay aids data interpretation.
- Ability to detect the presence of neutrons.

CORIS360® delivers value. Better data improves decision making for anyone working in radioactive environments.

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